



IT and Automotive

Starting the HPC Diagnostics of Tomorrow Today

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Vehicles are becoming ever smarter due to increasing digitalization. And that means they need correspondingly more processing power than can be provided by today's ECUs. High-performance computers (HPCs) are being integrated into the vehicle so as not to further increase the complexity of the E/E systems and the demands made of vehicle-internal communication. The integration of the HPCs and the connection to the Internet are enabling a new form of diagnostics. This is accomplished with SOVD, the diagnostic standard of tomorrow. With the Smart Diagnostic Engine, Softing currently has a function-oriented diagnostic runtime environment in use which already makes it possible to solve these new diagnostic tasks today.

Standardized HPC Diagnostics with SOVD

With the arrival of the high-performance PCs, new diagnostic tasks are being integrated in the vehicle: The HPC provides on-board diagnostics, function diagnostics and also – as it facilitates a connection to the Internet – the interface for conventional Electronic Control Units (ECUs). From the point of view of the external analysis tools, this

procedure represents a considerably higher quality of information, as a lot of information is already pre-filtered, aggregated and evaluated before transmission takes place. Such a diagnostic interface is not only of interest to OEMs, but also to numerous other parties: manufacturers of HPCs, ECUs and testers as well as fleet operators, testing organizations, insurance companies and legislators. The standardization of the interface thus stands to reason. This is currently taking

place at ASAM e.V. under the name SOVD (Service Oriented Vehicle Diagnostics) and is already available as a Version 1.0. The aim is to define an interface which allows diagnostics on a vehicle, for example in a repair shop (proximity), via remote access or as a tester directly in the vehicle (in-vehicle). As many existing technologies and standards as possible should be used and combined to simplify standardization and subsequent implementation.

Today's diagnostic protocols usually work in request-response mode. The tester usually queries individual data elements for each ECU and then evaluates them in the tester. The chunks of information are closely related and often available redundantly in different ECUs as well as temporarily uncorrelated. When it comes to service-oriented queries, however, only the exact information needed is determined. This means the pre-processing is already taken care of by the data server, in this case the SOVD server in the HPC. Whether the data for this was queried individually from the ECUs or was already continuously aggregated in the HPC is irrelevant. But SOVD is not going to replace today's classic diagnostics. Instead, existing applications, such as error memory operations, ECU programming and variant coding, will be replaced by new ones. A data-oriented use case is, for example, the option of reading out HPC-internal variables or large data containers. With reference to processes, it should be possible to analyze the vehicle status or log vehicle data in the HPC. Vehicle-related use cases include, for example, the execution of processes in the vehicle and the simultaneous access of multiple testers.

Softing SDE as SOVD Prototype

The idea of a diagnostic server as a Modular Vehicle Communication Interface Server (MVCI Server) with ODX data has existed for many years now. It is standardized and has already been supplemented with OTX for diagnostic sequences. However, the object-oriented API defined in the standard is not suitable for remote applications due to the large number of function calls required. This is why Softing has been using an extended solution for years; it is implemented as a platform-independent version and extends the MVCI server and the OTX runtime with a function-oriented API. With it, application engineers can always access precisely the functions they require, regardless of the diagnostic protocol. The implementation is manufacturer-specific or, depending on the function, even vehicle-variant-dependent. It can therefore be controlled via a configuration file (AGL, Application Guideline).

Today, Softing SDE is already in use in all kinds of areas: in PC applications in engineering, manufacturing and repair shops, on smart devices, but also in embedded applications such as data loggers and on Telematic Control Units (TCUs) in the vehicle. A comparison of the use cases with those of the SOVD server will reveal a complete match. Both solutions address in-vehicle, near-vehicle and remote applications, offer a function-oriented API and support today's classic diagnostics. The function-oriented approach is particularly well suited for remote diagnostics because it separates the retrieval and preparation of information from the often unreliable transmission link. A request is made to the diagnostic server; the server obtains data from various sources

and prepares it. The result is then reported back. Delays do not affect the validity of the information.

One example of the numerous possible applications is remote engineering, in which rare test vehicles are managed centrally and can be used and updated by different users all over the world. In the repair shop, a service technician can receive remote support from a technical center in complicated



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cases. This is particularly important when the repair shop has to come to the vehicle, for example in the case of construction machinery and agricultural equipment. The integration of Softing SDE in the VCI is a great advantage, particularly in manufacturing, as the complete diagnostic solution can be plugged into the right place in the vehicle and diagnostic sequences can then be performed at all line positions independently of the WiFi coverage. A WiFi connection is then no longer required for flash programming; test results from autonomous processes in the VCI are read out at a suitable point.

Beginning the Diagnostics of Tomorrow Today

Using a standard has advantages especially when there is considerable cooperation with other companies. Regardless of this, there is something to be said for starting with established implementations such as Softing SDE today: The parallelism of legacy and new implementation, a functioning ODX data process and the continuity of the solution. Even though in the case of new vehicles significantly more diagnostics can be implemented in the vehicle due to the introduction of HPCs, today's vehicles will still need to be maintained and repaired for decades. If both solutions use similar basic functionalities, the change-over will be simpler and less error-prone. The introduction of functioning data processes in particular requires a great deal of effort – today, these processes are stable. Integrating Softing SDE merely results in re-localization. The data is then available in encrypted form on the HPC in the vehicle, but the release procedures remain the same as they are today. Finally, the data processing chain is closed: In engineering and development, the SDE is integrated in the engineering tester on the PC, in manufacturing, it moves to the VCI, and, in the event of service, it is available in the HPC as part of the vehicle. Once the SOVD methodology is implemented in the company, a corresponding extension can be retrofitted. Diagnostics remains reliable in all cases because data and runtime behavior never change.

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About Softing Automotive

The core areas of expertise of the "Automotive Electronics" segment of the Softing Group, diagnostics and testing, provide the industry with key technologies. For more than 40 years, leading vehicle manufacturers, system and ECU suppliers have placed their trust in Softing as a technology expert.

Softing Automotive is your specialist for the entire life cycle of electronic control units and systems, from engineering through manufacturing to service. Our portfolio comprises hardware and software products, customized solutions as well as consulting and engineering support on site. All our developments are based on standardization which is why Softing is an active member of the most important standardization committees in automotive electronics, such as ASAM and ISO. Our customers therefore benefit immediately from the results of standardization.

Softing Automotive is one of the market leaders with over 100,000 installations in the growth market of test and diagnostic systems in vehicle electronics. All over the world, manufacturers of cars, motorcycles and commercial vehicles as well as their suppliers rely on tried and tested tools and solutions from Softing.